GEMINI

GM832

SVC

DOCUMENTATION

ISSUE 1

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1. INTRODUCTION

1.1. This Manual

This manual describes the Gemini GM832 SVC hardware. In other words, it concentrates on the physical connection of the board to a system, and of peripheral devices to the board. It also describes the purpose of the link options on the board and operation of the on-board switches. However, the actual purpose of the switches will depend upon the particular on-board monitor program (SVC-MON) being used. This manual should therefore be read in conjunction with the SVC software manual for the version of SVC-MON in use.

1.2. The SVC

The Gemini GM832 SVC (Super Video Controller) Board is an 80-BUS compatible video display board for use with Gemini MultiBoard and Nascom 2 based microcomputer systems. It may also be used with other computer systems by connecting them to the 80-BUS connector. The design has been optimised to allow all major parameters of the board (screen format, character set etc) to be varied under software control. In its standard configuration the SVC will display 25 lines of 80 characters, although simple software commands will change this to either 25 lines of 40 characters or a bit-mapped graphics mode of 256 x 256 pixels. In addition the SVC may be programmed to operate in different configurations.

All of the screen handling of the GM832 SVC is controlled by an on-board Z80B microprocessor running at 6MHz. The controlling program is contained in a 2764 8Kbyte EPROM, and a 2Kbyte RAM device provides the memory for on-board buffers, workspace, and key-table definitions. An 8Kbyte RAM provides the screen, character generator and graphics memory. In text mode this allows all 256 of the character shapes to be modified under software control. It also provides multiple software-selectable screens - two in 80 x 25 mode, four in 40 x 25 mode.

Hardware features of the SVC allow for the boards output to be blanked or inverted. In addition various display attributes may be set - blinking, half-tone background, and half-intensity characters. An on-board buzzer is provided. The system keyboard is normally connected via the SVC, this providing the programmable key function as well as a type-ahead buffer. The keyboard may have either a parallel or serial interface, and the interface details are given in this manual. A light pen socket is provided, as well as an expansion connector. Four switches are provided for setting up default conditions on the board. The interface to the host computer system is via three I/O ports.

2. Commissioning

Carefully unpack your GM832 and examine it for any mechanical damage. In the event of any damage please inform your dealer immediately.

Your GM832 will have been shipped to you fully tested and working. All that may be required is for the board to be plugged in to the system. However, please take the time to read this manual as it will prove useful.

When plugging the GM832 into the bus take care. Excessive force should not be required. Any difficulty will, in all probability, be due to the keyway of the edge connector not fitting accurately into the slot in the edge of the board. Ensure that the board is plugged in with the edge connector going in first and the correct way around. It is not possible to plug the board in the incorrect way round because of the keyway.

There are a number of link and switch options on the GM832. The standard positions will have been selected during manufacture. However, full details are provided in the section on links to allow the user to configure the board for his own requirements.

3. Connectors

There are seven I/O connectors on the GM832 - parallel keyboard, serial keyboard, light pen, video out (DIN and pins), expansion, and 80-BUS. Their connections are detailed below.

3.1. PL1

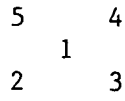
PL1 is the 78 way 80-BUS connector. In Gemini MultiBoard and Nascom systems connection is made to this simply by plugging the board into the bus. However the board may be connected quite simply to other systems. The following 80-BUS lines are connected on the GM832:

1 - 4	Ground	System ground.
12	/NASIO	Required for Nascom systems.
16	/BAI	) 80-BUS DMA daisy chain - not used
17	/BAO	) by GM832, so linked together.
19	IEI	) 80-BUS interrupt daisy chain
20	IEO	) - not used by GM832, so linked.
25	/M1	Used for GM832 decoding purposes.
26	/IORQ	" " " " "
28	/WR	Active low to write to GM832.
29	/RD	" " " read from "
30 - 37	A0 - A7	Used for GM832 decoding purposes.
49	Ground	System ground.
50 - 57	D0 - D7	Data bus to/from GM832.
67	Ground	System ground.
70 - 71	-12V	-12V supply rail.
72	KEYWAY	
73 - 74	+12V	+12V supply rail.
75 - 78	+ 5V	+ 5V " "

There is a seperate section describing connecting the GM832 to systems other than 80-BUS base computers.

3.2. PL2 - Video Out

PL2 is a 5 pin 'domino' DIN socket, providing the video ouput signal from the GM832. Looking at the board with component side up, and with PL2 on the left, the pin numbering is:



These are connected as follows:

Pin 1	Vertical Synch. output of CRTC IC
Pin 2	Ground
Pin 3	Ground
Pin 4	Video out (Composite video, 1V peak-to-peak)
Pin 5	Horizontal Synch. output of CRTC IC

The Composite Video out is also available from the two pins adjacent to PL2:

Pin 4	Video out (Composite video, 1V peak-to-peak)
Pin 5	Ground

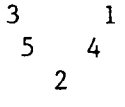
There are also link options on the board to allow two modifications to be made, if required, to the video output stage of the GM832.

1) A 100uF coupling capacitor may be inserted into the composite video output. This is done by cutting the trace 'C3' on the component side of the board alongside the PL2 connector, and soldering in a capacitor.

2) The power supply to the video output circuitry may be isolated with a ferrite bead. This is done by cutting the trace 'L1' (found between IC9 and IC10) and soldering in a ferrite bead.

3.3. PL3 - Light Pen Socket

PL3 is a 5 pin 180' DIN socket, providing a light pen input facility to the GM832. Looking at the board with the component side up, and with PL2 on the left, the pin numbering of PL3 is:

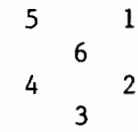


These are connected as follows:

Pin 1	+12 volt output
Pin 2	Ground
Pin 3	Light pen switch input
Pin 4	+5 volt output
Pin 5	Light pen strobe (to CRTC IC)

3.4. PL4 - Serial Keyboard Input

PL4 is a 6 pin 240' DIN socket, providing the GM832 with a serial keyboard input. Looking at the board with the component side up, and with PL4 on the right, the pin numbering is:



These are connected as follows:

Pin 1	+12 volt output
Pin 2	Clock input (TTL)
Pin 3	Ground
Pin 4	Serial data input (TTL)
Pin 5	+12 volt output
Pin 6	Ground

When a serial keyboard is in use then two links must be set accordingly. These are LKA (found between IC6 and IC16) and LKB (found between IC21 and IC26). For Serial keyboard operation these links must both be inserted.

3.5. PL5 Expansion Connector

PL5 is a 26 way ID connector, found between IC27 and IC39, to allow for I/O expansion of the GM832. The connections present are:

+5V	1	2	/RD
/INT	3	4	D1
/IORQ	5	6	D0
RESET	7	8	D7
GND	9	10	D2
3MHz CLK	11	12	/WR
D5	13	14	A0
D6	15	16	A1
D3	17	18	A2
D4	19	20	N.C.
N.C.	21	22	N.C.
+12V	23	24	N.C.
-12V	25	26	A7

This connector has been placed on GM832 to allow for the addition of an RS232 serial board using an 8250 type UART, occupying 8 I/O ports. As the GM832 is NOT decoded fully internally, A7 is used to select the I/O expansion, and so the 8 ports will repeat from 80H-87H to F7H-FFH. The 3MHz clock is provided for division by the 8250 to generate programmable baud rates.

Two mounting holes are provided on the GM832 for the attachment of an I/O expansion board in a 'piggy-back' fashion. One hole is between IC21 and IC26, and the other hole is between IC17 and IC18.

If required other boards may be added to the GM832 using the PL5 connector. Note that the Z80 on the GM832 will normally be running at 6MHz and thus any expansion board must be capable of running at this speed.

N.B. In the current release of the SVC Monitor program (Vers. 4.01) there is NO software support for any expansion board, and consequently the addition of a board would entail either modification to the monitor program, or a down-loaded user program (see the SVC software manual).

3.6. PL6 - Parallel Keyboard Input

PL6 is a 16 pin ID connector, providing the GM832 with a parallel keyboard input. The Gemini GM821 59 key keyboard, GM827 87 keyboard, GM852 low profile keyboard (parallel version) and the foreign character versions of each of these may be attached directly to this connector. Looking at the board with the component side up, and with PL6 on the right, pin 1 of the connector is on the right.

N.B. Take great care when connecting a parallel keyboard to ensure that you are connecting the keyboard cable the correct way round, or damage WILL occur to both the keyboard and the GM832.

The connections on PL6 are as follows:

+5V	1	2	/STROBE
GND	3	4	GND
D5	5	6	D4
D6	7	8	GND
GND	9	10	D2
D3	11	12	D0
D1	13	14	+5V via 220R resistor
-12V	15	16	D7

When a parallel keyboard is in use then two links must be set accordingly. These are LKA (found between IC6 and IC16) and LKB (found between IC21 and IC26). For Parallel keyboard operation these links must both be removed.

4. On-board Switches

There are four switches on the GM832, S1-4. The state of these may be read by the SVC monitor program, and so they are normally used to specify certain default power-up conditions. The exact use of the switches will therefore depend upon the SVC monitor program in use, and so reference should be made to the SVC software manual.

With SVC monitor Vers. 4.01 the switches are used as follows:

S1 - determines whether the keyboard in use outputs only single-byte codes, e.g. GM821, or double-byte codes, e.g. GM827.

S2, S3 and S4 - Select optional foreign language character sets. Note these may also be selected in software.

5. On-Board Links

There are 5 on-board links which may be modified by the user. Four of these have already been covered above:

L1 - To be cut if a ferrite bead is to be added to the video output circuitry.
C3 - To be cut if a coupling capacitor is to added in the video out signal.
LKA - Inserted for serial keyboard, omitted for parallel keyboard.
LKB - " " " " " " " "

5.1. /NASIO

The fifth link determines whether or not the GM832 generates a /NASIO signal onto the bus. If the link is made a /NASIO signal will be generated. The /NASIO signal is only required for systems based on the Nascom 1 or Nascom 2 boards. Only one board in a system needs to generate /NASIO. If the GM832 is to be used with a Nascom then the IOEXT link (Nascom 1) or switch (Nascom 2) should be set to 'External'. With Nascom 1 there is a decode fault that necessitates the removal of the Z80 PIO when external I/O is used.

NOTE: The GM832 does not normally produce the Nasbus DBDR signal that is required by Nascom 1. If it is required to use GM832 in a system based on a Nascom 1 then there are two ways of doing this:

1) Add an open collector buffer onto the GM832 between the pin 3 output of IC33 and bus line 13. (Through-plated holes are provided for connection.)

2) Implement additional circuitry on the Nascom to establish the required databus direction, and switch DBDR accordingly. The advantage of this approach is that other 80-BUS boards that do not provide DBDR may be used in the Nascom system without modification.

6. SVC-Host Interface

The GM832 occupies three I/O ports belonging to the host system. The first port is for the transfer of data between the host and the GM832. The second port is for the handshake signals between the host and the GM832. The third port is to enable the host system to reset the GM832, as the bus reset line is not connected to the GM832. As multiple GM832 boards may be used in a single system, this allows them to be reset independantly.

The bottom eight address lines of the 80-BUS (A0-A7) are connected to the eight address inputs of the port decode PROM (IC44). /IORQ and M1 are connected to the /CE inputs of the PROM to ensure that it only decodes valid I/O port addresses. The four data outputs from the PROM are pulled up by 4K7 resistors to ensure that the outputs remain high when the PROM is not enabled. The data outputs from the PROM are assigned as detailed below.

Data output	Function
D0	/NASIO
D1	Data transfer
D2	Handshaking
D3	Reset

The PROM is coded in the following manner:

a) Select the ports to which you wish the above functions to be assigned. It would be usual to assign the lowest eight ports to decode a Nascom 1 or 2 via /NASIO.

b) The 256 locations in the PROM are directly mapped to the 256 I/O ports available. One merely has to load the particular location in the PROM with the contents which will take the appropriate data output low and enable the specific circuitry.

c) D0 will go low if the location contains an E, D1 will go low if the location contains a D, D2 will go low if the location contains a B and D3 will go low if the location contains a 7.

The following table gives the contents for the standard GM832 PROM (VID-1):

PROM location	Contents	Function
00-07	E	/NASIO
08-B0	F	No function
B1	D	Data port
B2	B	Handshake
B3	7	Reset

The PROM used is a 256 x 4 open collector type. The part is available from numerous sources, programming however is unique to each part. For a custom PROM please contact your Gemini dealer.

Manufacturer	Part Number
AMD	27S20C
Fairchild	93417DC
Fujitsu	MB7052
Harris	7610-5
Intel	3621
Intersil	5603AC
MMI	6300-1
Nat. Semi.	74S387
NEC	uPB403D
Signetics	N82S126
Texas Inst.	TBP24SA10 - recommended part.

7. GM832 I/O and Memory Maps

When downloading user programs it may be useful to know the on-board mapping of the GM832s I/O and memory devices.

The SVCs Z80 memory space is decoded into eight blocks of 8K bytes with the following assignments:

(N.B. None of this memory may be accessed directly by the host processor, this is the memory map seen by the SVCs own Z80 processor.)

Address	
0000-1FFF	SVC Monitor EPROM (8K)
2000-3FFF	Video display/Character Generator RAM (8K)
4000-5FFF	Control port - 1
6000-7FFF	Status port
8000-9FFF	Keyboard port
A000-BFFF	Host/SVC Data port
C000-DFFF	Control port - 2
E000-FFFF	Workspace RAM (2k)

7.1. Control port 1

This is a write-only 'port' with the following functions:

Bit	Function
0	Graphic mode/Text mode select
1	Keyboard status to Host/SVC interface
2	Enable/Disable interrupts from Host/SVC interface
3	40 wide/80 wide select
4-7	None

7.2. Control port 2

This is a write-only 'port' with the following functions:

Bit	Function
0	Full screen invert
1	Turn on beeper
2	Blank display (and disable memory access arbitration circuitry)
3	Reset CRTC IC
4	Enable character blink attribute
5	Enable character half-tone attribute
6	Enable character half-intensity background attribute
7	Select top 128/bottom 128 characters of character set

7.3. Status port

This is a read-only 'port' with the following functions:

Bit	Function
0	Character waiting at host
1	Character waiting at keyboard
2	On-board DIL switch
3	" " "
4	Light pen switch
5	On-board DIL switch
6	" " "
7	Output host character buffer free